

REMARKS

Claims 1-2, 4-8, 10-14, and 21-26 were previously presented. Claims 23 and 25 stand objected to and are canceled herein.

Thus, claims 1-2, 4-8, 10-14, 21-22, 24 and 26 are all the claims presently pending in the application. All the claims presently pending stand rejected on prior art grounds. Additionally, claims 21-26 stand rejected upon informalities. Applicants respectfully traverse these rejections based on the following discussion.

I. The 35 U.S.C. §112, First Paragraph, Rejection

Claims 21-26 stand rejected under 35 U.S.C. §112, first paragraph. These rejections are traversed as explained below. Specifically, the Office Action provides that the application does not support the orientation of the claimed fins. The Applicants respectfully disagree as Figure clearly illustrates such vertically oriented fins. However, in order to overcome the rejection and move the application towards allowance, the limitation that the fins be “vertically oriented” has been removed from claims 21-26. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw this rejection.

II. The Prior Art Rejections

Claims 1-2, 4-8, 10-14, and 21-26 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Yang, et al. (U.S. Patent No. 5,868,843), hereinafter referred to as Yang, in view of Mahvan, et al. (U.S. Patent No. 5,614,071), hereinafter referred to as Mahvan.

Applicants respectfully traverse these rejections because there is a lack of suggestion or motivation to combine the cited prior art references. Furthermore, the cited prior art references do not teach or suggest all of the claim limitations.

A. Summary Of The Cited Prior Art References And The Present Invention.

Per the Abstract, Yang teaches a detachable sponge device for a spin coating machine used to coat a liquid material over a semiconductor wafer is provided. The detachable sponge device is used to prevent a solvent (that is jetted only on the edge of the wafer to remove a bead of the coating material on the wafer's edge) from being oversprayed elsewhere on the wafer. The detachable sponge device is composed of a curved mounting piece and a corrugated piece of sponge attached on the curved inner side of the mounting piece. The mounting piece can be detachably mounted on the spin coating machine. The corrugated piece of sponge can absorb splattered particles of solvent from the wafer which can thus be prevented from bouncing back onto the wafer.

Per the Abstract, Mahvan teaches a shield for use in a sputtering system. The shield includes a support having an inner expanse defining a two-dimensional array of cavities. The cavities are formed of two-dimensionally concave wall surfaces, where the intersections of the wall surfaces of adjacent cavities form a two-dimensional array of edges on the expanse. The shield minimizes the tendency of material deposited on the shield surface, such as sputtered carbon material, from flaking off during a sputtering operation. Also disclosed is a sputtering assembly that employs the shield.

Like Yang, the present invention similarly provides an apparatus with a shield capable of

capturing overspray of a solvent or cleaning fluid from a rotating wafer. However, the present invention is designed not just to capture such overspray, but to prevent the fluid and foreign matter particles that are ejected from the surface of the wafer from forming a mist and being re-deposited back onto the wafer.

B. Lack Of Suggestion/Motivation To Combine Yang And Mahvan.

The Applicants submit that there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the teachings of Yang and Mahvan. Specifically, it is generally understood that the teaching, suggestion, or motivation to combine references "must be found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art and that the "test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art." (see *In re Kotzab*, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000)). The Applicants submit that a motivation to combine the references is not explicitly or implicitly shown in the references because, while both references teach wafer shields, the purpose and functions of the respective shields (i.e., the natures of the problems to be solved) are significantly different.

Specifically, as discussed above, Yang teaches a corrugated piece of sponge used to absorb splattered solvent from a rotating wafer which can thus be prevented from bouncing back onto the wafer. Mahvan on the other hand teaches a shield for use in a sputtering system (i.e., in a system that deposits ejected atoms of a material, such as carbon, onto a substrate). Mahvan

discloses that a typical sputtering shield has a smooth surface and is used to receive wide-angle deposition of atoms (e.g., carbon) that are not directed against the target (see col. 1, lines 30-38).

That is, the shield of Yang is designed *to limit splatter from a fluid directed to the wafer*, whereas the shield in Mahvan is designed *to capture atoms ejected not at the wafer, but rather at a wide-angle away from the wafer*. Additionally, as discussed in detail at col. 4, line 56-col. 5, line 20, Mayan noted that sputter material deposited on a smooth shield has a tendency to flake off the shield over time as a result of shield buckling in response to global thermal expansion/contraction, when the sputtering shield is heated then cooled. Therefore, the shield structure of Mahvan is designed to minimize flaking by depositing atoms into cavities on the shield surface. These cavities minimize the compressive forces acting on the deposited material.

Given the shields of Yang and Mahvan are designed to receive different materials (e.g., fluid vs. atoms), to receive the different material in different manners (i.e., splattering from the wafer vs. direct wide-angle ejection from a sputtering system), to interact differently with the different materials (i.e., absorption vs. deposition) and to solve different problems related to the different materials (i.e., to eliminate immediate back splattering onto the wafer vs. to eliminate flaking into the sputtering plasma overtime), the Applicants submit that the teachings of the cited prior art and the knowledge of one of ordinary skill in the art, as a whole, would not have suggested the desirability of the claimed invention.

C. All Claim Limitations Are Not Taught Or Suggested By The Combination of Yang And Mahvan.

The Applicants further submit that neither Yang, nor Mahvan, teach or suggest all of the

patentable features of amended independent claims 1, 8 and 21. Specifically, the Applicants submit that the neither Yang, nor Mahvan, teach or suggest the feature in amended independent claim 1 of “wherein a surface of said shield facing said substrate comprises a semi-permeable material adapted to prevent said fluid and said foreign matter particles from forming into a mist and being re-deposited back on said substrate.” The Applicants further submit that neither Yang, nor Mahvan, teach or suggest the following features in amended independent claim 8: (1) “wherein a surface of said shield facing said semiconductor wafer comprises a semi-permeable material having absorptive fins”; and (2) wherein said semi-permeable material with said absorptive fins prevents said cleaning fluid and said foreign matter particles from forming into a mist and being re-deposited back on said semiconductor wafer.” Finally, the Applicants submit that neither Yang, nor Mahvan, teach or suggest the following features in newly added independent claim 21: (1) “a disposable liner on a surface of said shield facing said substrate”; (2) “wherein said disposable liner comprises a screen material having screen openings facing said substrate”; and (3) “wherein said screen material with said screen openings prevents said fluid and said foreign matter particles from forming into a mist and being re-deposited back on said substrate.”

The Office Action provides that Yang teaches a “semi-permeable material prevents fluid ejected from the surface of the rotating substrate from forming into a mist and being re-deposited back on said substrate (col. 3 lines 1-8)”. The Applicants respectfully disagree.

As discussed above, Yang teaches a detachable sponge device composed of a curved mounting piece and a corrugated piece of sponge attached to the mounting piece to absorb splattered solvent jetted at the wafer’s edge from bouncing back onto the wafer surface (see

Abstract). The present invention identified a problem associated conventional clean stations used to clean the entire surface of the substrate and this problems goes beyond just backsplash to mist formation. Nowhere in the cited portion of Yang does it disclose that mist formation is prevented by the sponge device.

Specifically, during prior art substrate surface cleaning processes, a mist of cleaning fluid and foreign matter particles can accumulate within the shield and cause the foreign matter particles to be re-deposited on the cleaned wafer (see paragraphs [0004]-[0005]). The present invention does not just prevent back splatter problem identified by Yang, but rather provides a shield lined with a semi-permeable semiconductor material that is particularly adapted (e.g., with perforations, screen holes, fins, etc.) to prevent cleaning fluid and foreign matter particles that are ejected from the substrate from forming into such a mist (see paragraphs [0017]-[0018]). Yang only discusses back splatter, not mist formation, and nothing in the Yang disclosure teaches or suggests that the sponge device of Yang is further adapted to prevent this mist formation. The sponge device of Yang is not a liner but rather is a sponge structure that attaches to a portion of the shield and that has a smooth corrugated surface (see Figure 3 of Yang). While this sponge material may be absorptive and, thereby, capable of performing the task for which it was designed (namely, preventing back splatter), it is not adapted to prevent mist formation. The sponge device of Yang alone without the additional structural components of the present invention, such as screen openings, perforations and/or fin, would not be sufficient to eliminate mist formation.

Furthermore, the Applicants respectfully disagree with the assertion in the Office Action that the “adapted to” limitation in claim 1 does not constitute a limitation in any patentable sense

(citing *In re Hutchison*, 69 USPQ 138). The Applicants respectfully disagree. There is support for a holding that “adapted to” clauses in claims further limit the claimed subject matter and should not be disregarded (e.g., see *In re Venezia* 530 F.2d 956, 958-59, 189 USPQ 149, 151-52 (CCPA)). Additionally, MPEP§2173.05(g) reiterates that functional language does not render a claim improper. Rather the functional limitation must be evaluated and considered, just like any other limitation, for what it fairly conveys. In this case, not only must the surface of the shield facing the substrate comprises a semi-permeable material, but that semi-permeable material must be configured such that it prevents (i.e., adapted to prevent) fluid and foreign matter particles from forming into a mist and being re-deposited back on the substrate.

Amended independent claim 8 further includes the additional limitation of the semi-permeable material having absorptive fins. The Office Action provides that Yang also teaches “a semi-permeable material (or sponge) having absorptive fins (projections or corrugations) (col. 2 lines 63-65).” The Applicants respectfully disagree. As mentioned above, Yang teaches a detachable sponge device composed of a curved mounting piece and a corrugated piece of sponge. Specifically, the cited portion of Yang provides “a corrugated piece of absorbent material 31, such as sponge, attached on the curved inner side of the mounting piece 32. The corrugated piece of sponge 31 is substantially equal in length to the mounting piece...” The cited portion of Yang does not refer to projections or fins. Furthermore, those skilled in the art would recognize that a corrugated piece of material is not the equivalent of a piece of material having fins. That is, the term “corrugated” is generally understood to mean shaped into parallel folds or grooves (see *Dictionary.com Unabridged* (v 1.1) Based on the Random House Unabridged Dictionary, © Random House, Inc. 2006.) and the material 31 of Yang is illustrated in Figure 2

as having such parallel grooves. Contrarily, fins are generally understood to mean projections that resemble fins (e.g., a fixed structure 30 projecting outward from the material 12, as illustrated in Figure 3).

Amended independent claim 21 further includes the additional limitations of a disposable liner on the surface of the shield and that this disposable liner comprises a screen material having screen openings facing the substrate. Specifically, as described in paragraphs [0016]-[0017] of the specification, the present invention comprises a shield and the surface of the shield can comprise a permanent or disposable semi-permeable material, which in turn can comprise, for example, an absorptive material, a screen material, a perforated material etc. Claim 21 is amended to reflect an embodiment in which a screen material, with screen openings facing the substrate, is used as a disposable liner for the shield. Neither Yang nor Mahvan teach such a screen material lining the shield with screen openings facing the substrate. Again, Yang teaches corrugations in a sponge, whereas Mahvan teaches an array of cavities on a wall surface.

Therefore, amended independent claims 1, 8 and 21 are patentable over Yang and Mahvan. Further, dependent claims 2, 4-7, 10-14, 22, 24 and 26 are similarly patentable, not only by virtue of their dependency from a patentable independent claim, but also by virtue of the additional features of the invention they define. Moreover, the Applicants note that all claims are properly supported in the specification and accompanying drawings, and no new matter is being added. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejections.

III. Formal Matters and Conclusion

With respect to the rejections to the claims, the claims have been amended, above, to overcome these rejections. In view of the foregoing, the Applicants submit that claims 1-2, 4-8, 10-14, 21-22, 24 and 26, all the claims presently pending in the application, are patentably distinct from the prior art of record and are in condition for allowance. Therefore, the Examiner is respectfully requested to reconsider and withdraw the rejections to the claims and further to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary. Please charge any deficiencies and credit any overpayments to Attorney's Deposit Account Number 09-0456.

Respectfully submitted,

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